REMARKS

I. CLAIM OBJECTIONS

A. Claim Numbering Under 37 C.F.R. § 1.126

The Examiner objected to the numbering of the claims stating that the numbering is not in accordance with 37 C.F.R. § 1.126, which requires the original numbering of the claims to be preserved throughout the prosecution. The Examiner stated that claim 26 was missing and that therefore, misnumbered claims 27-43 were renumbered as 26-42.

Applicants acknowledge that claim 26 was missing and that the misnumbered claims 27-43 should be renumbered as 26-42.

B. Antecedent Basis Under 37 C.F.R. § 1.75(a)

The Examiner objected to claims 7 and 8 under 37 C.F.R. § 1.75(a) as failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention or discovery. The Examiner stated that both claims lack an antecedent basis for "the predetermined features".

Applicants respectfully submit that claims 7 and 8 are in proper format under 37 C.F.R. § 1.75(a). Claim 1, which both claims 7 and 8 depend from, states in lines 7-8, "a program in the processor analyzing the image to detect predetermined features of the tubing segment." Applicants submit that the "predetermined features" text in claim 1 provides the proper antecedent basis and therefore claims 7 and 8 are in proper format under 37 C.F.R. § 1.75(a)

II. CLAIM REJECTIONS – 35 U.S.C. § 102

A. Rejection of Claim 10 Under 35 U.S.C. § 102(e) as Anticipated by Precision Tube Technology

The Examiner rejected claim 10 under 35 U.S.C. 102(e) as being anticipated by Precision Tube Technology.

Applicants cancel claim 10.

B. Rejection of Claim 10 Under 35 U.S.C. § 102(e) as Anticipated by Terry et al.

The Examiner rejected claim 10 under 35 U.S.C. § 102(e) as being anticipated by Terry et al. (U.S. Patent No. 6,296,066 B1).

Applicants cancel claim 10.

C. Rejection of Claims 1, 2, 31, 36, and 38 Under 35 U.S.C. § 102(e) as Anticipated by Newman

The Examiner rejected claims 1, 2, 31, 36, and 38 under 35 U.S.C. § 102(e) as being anticipated by Newman (U.S. Patent No. 6,321,596 B1). The Examiner stated that, regarding claim 1, Newman teaches an imaging device recording video signals of a segment of coiled tubing as the tube is employed into a well, a conductor transmitting the signals to a processor, an image grabber generating an image of the tubing, and a program in the processor analyzing the image to detect predetermined features of the tubing segment. The Examiner stated that, regarding claim 2, the coordinates of the tubing segment are generated. The Examiner stated that, regarding claims 31 and 36, the limitations therein are met by Newman as described in the claim 1 rejection. With regards to claims 31 and 36, the Examiner stated that Newman processes images from cameras of the stripes to determine rotation of the tube, among other things, "along the length of the coiled tubing". Regarding claim 38, the Examiner stated that Newman anticipates camera locations along a levelwind.

The Examiner rejected claims 1, 2, 31, and 36 under 35 U.S.C. 102(e). Applicants traverse whether the Newman is a 102(e) reference. However, Applicants assume the Examiner intended to assert Newman under 35 U.S.C. § 102(b) or will do so in the future and will proceed as such.

Newman teaches a fatigue tracking system including an electronic data acquisition system 207, a computer 210 with modeling software, sensor(s), and, optionally, a device for applying rotational torque to the coiled tubing. Suitable recording, storage, display, transmission and output devices measure, record, display, and transmit parameters of the coiled tubing. Newman teaches that the sensor(s) measure rotational orientation of the coiled tubing in any combination with one, some or all of the following: its depth (length), weight (axial load while straight), internal pressure, reel back tension (axial load while bending), wall thickness diameter and ovality of the coiled tubing. Newman teaches that the sensor(s) provide a signal thereof to the data acquisition system 207, which stores this data in a database. Newman teaches that the computer 210 then uses this data to calculate the amount of fatigue damage and deformation for various segments along the length of the coiled tubing. Specifically, computer models use the data, including rotational orientation, to calculate the fatigue damage and predict the fatigue life, either in real time while the coiled tubing is being used or after each usage is completed.

With regards to rotational orientation, Newman teaches marking coiled tubing and measuring the locations of markings in a variety of ways. In one aspect, Newman marks a visible line, a series of visible lines, or dots along the length of the coiled tubing. The rotational orientation of the line, lines, or dots is monitored visually, with optical scanning device(s), or with camera(s) and the location from which amount of rotation can be calculated is logged manually or electronically.

Thus, in the Newman system, the optical scanning devices send a signal indicating the rotational orientation to the data acquisition device 207. The data acquisition device 207, which is separate from the computer 210, then converts the signal to data and stores, or logs, the data relating to the rotational orientation in a database. In doing so, the data acquisition device 207 converts the electronic signal to "engineering units" data that the computer 210 can read. The data

is then used by the computer 210 to calculate the amount of fatigue damage and deformation of the coiled tubing. Optionally, the computer 210 may then send a signal to the system for rotationally orienting the coiled tubing to reduce fatigue based on a model using the data from the data acquisition device 207.

Regarding claim 1, Applicants respectfully submit that Newman does not teach an image grabber generating an image of the tubing. The Examiner stated that the data acquisition device 207 functions as the image grabber because, given that one of the sensors may be a camera, the data acquisition device 207 necessarily grabs frames, or images from the camera. As Newman teaches, the data acquisition device 207 receives the signals indicative of the rotational orientation or other parameters from the sensors and converts them into "engineering units" that are readable by the computer 210. Therefore, instead of generating an image of the tubing, the data acquisition device 207 is actually generating numerical data representing the rotational orientation of the coiled tubing. Therefore, the data acquisition device 207 is not an image grabber generating an image of the tubing.

Additionally regarding claim 1, Applicants respectfully submit that Newman does not teach a program in the processor analyzing the image to detect predetermined features of the tubing segment. The Examiner first equated the computer 210 of the processor required by the claim. The Examiner then stated that in Newman, images of "a visible line", or "lines", or "dots" marked along the length of the tubing are captured and analyzed for "location" and "amount of rotation" of the tubing. As explained above, the computer 210 of Newman only analyzes digital numerical data sent to it from the data acquisition device 207. Therefore, the computer 210 does not analyze an image at all. In addition, the computer 210 only uses data already provided by the data acquisition device 207 to calculate the fatigue damage. The computer 210 does not perform any analysis to detect predetermined features of the tubing.

Applicants submit that, because Newman does not teach an image grabber generating an image of the tubing or a program in the processor analyzing the image to detect predetermined features of the tubing segment, Newman does not anticipate claim 1 under 35 U.S.C. § 102(e) or (b). Therefore, Applicants submit that claim 1 is in condition for allowance.

Regarding claim 2, Applicants repeat the arguments made for claim 1. Because claim 2 depends from claim 1, Applicants submit that Newman also does not anticipate claim 2 under 35 U.S.C. § 102(e) or (b) and that claim 2 is in condition for allowance.

Regarding claim 31, Applicants repeat the arguments made for claim 1. As stated, the sensors in Newman send a signal to the data acquisition device 207, which then converts the signal to data that can be read by the computer 210. Newman does not teach transmitting any images to the computer 210. Nor does Newman teach receiving the images by the computer 210 and inputting the images to computer vision software running on the computer 210. Nor does Newman teach processing the images on the computer vision software in the computer 210. Applicants thus submit that Newman does not anticipate claim 31 under 35 U.S.C. § 102(e) or (b) and that claim 31 is in condition for allowance.

Regarding claims 36 and 38, Applicants repeat the arguments made for claim 1 and 31. Because claims 36 and 38 depend from claim 31, Applicants submit that Newman also does not anticipate claims 36 and 38 under 35 U.S.C. § 102(e) or (b) and that claims 36 and 38 are in condition for allowance.

III. CLAIM REJECTIONS - 35 U.S.C. § 103

A. Rejection of Claims 11-14 Under 35 U.S.C. § 103(a) as Being Unpatentable Over Terry et al. and Newman

The Examiner rejected claims 11-14 under 35 U.S.C. § 103(a) as being Unpatentable over the combination of Terry et al. (U.S. Patent No. 6,296,066 B1) and Newman.

1. Claims 11 and 12

Regarding claims 11 and 12, the Examiner stated that Terry does not teach one or more stripes on the outer layer parallel with the longitudinal axis of the tubing or the stripes being individually distinguishable. However, the Examiner stated that Newman teaches a system in the same field of well digging, and same problem solving area of monitoring faults in tubing, where Newman teaches tubing with plural stripes individually distinguishable from one another.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to mark the tubing of Terry et al., with the lines taught by Newman, in order to provide an indication for the measurement of "amount of rotation" for "accurately determining coiled tubing fatigue life and/or deformation" to ensure proper functioning of the tube, and avoid the cost associated with a tube's failure during an operation.

Applicants have cancelled claims 11 an 12.

2. Claims 13 and 14

Regarding claim 13, the Examiner stated that Newman teaches an image device, processor, and program as described in the previous rejections. The Examiner also stated that Newman teaches the deployment and measurement of rotation of coiled tubing having longitudinal stripes.

Regarding claim 14, the Examiner stated that Newman's stripes are "visible" to the cameras, and are thus a predetermined color. The Examiner also states that Norman analyzes the images of the stripes to determine tube rotation, and thus detects the stripes as called for by the claim. The Examiner admitted that Newman does not teach a composite coiled tubing having layers of fibers forming the tubing wall. The Examiner stated that Terry teaches a coiled tubing for deployment into a well, the tubing comprising a composite coiled tubing having layers of fibers forming the tubing wall.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the tubing taught by Terry, as the tubing required by

Newman, because it is "very strong" and "resistant to abrasion", thus preventing premature wear and failure due to continuous deployment into and out of wells.

Claims 13 and 14 require an imaging device recording video signals of a segment of the coiled tubing and a processor receiving the video signals from the imaging device. Applicants repeat the arguments made above for claims 1 and 31. As stated above, the computer 210 in Newman is not a processor that receives the video signals from the imaging device. Nor does a program in the computer 210 in Newman analyze the video signals. Applicants thus submit that claims 13 and 14 are not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

B. Rejection of Claim 26 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Puffer

The Examiner rejected claim 26 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy et al. (U.S. Patent No. 5,767,671 A) and Puffer (U.S. 4,563,095 A). The Examiner stated that McCoy teaches a system for surface inspection of a coiled tube as it is being deployed. The Examiner admitted that, while McCoy is open to "any suitable type of measurement apparatus known in the art for taking the desired measurements", McCoy does not teach an image processing measurement apparatus commensurate with the requirements of claim 26.

The Examiner stated that Puffer teaches a system for inspecting an elongated tubular body in motion comprising a processor, an output device, an image input device receiving sequential images of the object, a patter classifier extracting features and comparing the size against user-defined thresholds, and where, if the size does not fall within the threshold, an interrupt indicating that a defect has been located is generated.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the inspection technique of Puffer, in order to determine and detect flaws in the tubing of McCoy. The Examiner stated that while the processor of Puffer is not explicitly taught as being computerized, given that the patent issued in 1986, it probably was. The Examiner then stated that, however, even if the process was not computerized, it would have been obvious at the time of the invention was made to one of ordinary skill in the art to program, in the McCoy and Puffer combination, the computer of McCoy to perform the analytical functions of Puffer.

McCoy teaches a method of testing coiled tubing comprising performing at least one test on a coiled tubing that has been used. McCoy teaches that performing such a test includes obtaining a specific output data event for the used coiled tubing. The McCoy method further comprises comparing the specific output data event with a predetermined sequence of output data events for determining where the sequence and the specific output data event correspond. The McCoy method still further comprises generating a coiled tubing status indication in response to where the specific output data event corresponds with the sequence as a measure of a point in the useful life of the used coiled tubing.

To perform the test on the coiled tubing, McCoy teaches a sensor 52, a computer 54, and an indicator 56 connected to obtain information about the coiled tubing. For a given point in time, the

sensor 52 obtains a specific output data event representative of at least one parameter correlated to the condition of the coiled tubing. The computer 54 is used to compare the specific output data event obtained via the sensor 52 with a predetermined sequence of output data events for determining where the sequence and the specific output data event correspond. Once the comparison has been made, the indicator 56 is used for generating a coiled tubing status indication in response to where the specific output data event corresponds with the predetermined sequence of output data events as a measure of a point in the useful life of the coiled tubing. The indicator 56 can be, for example, a display screen driven to graphically or numerically or alphabetically display the result of the functions performed by the sensor 52 and the computer 54.

Puffer teaches a method and apparatus for monitoring the surface of an elongated, generally circular object. Puffer teaches irradiating a thin annular zone of the coated surface of the cable by electromagnetic energy directed so as to be incident therewith at a selected angle, typically normal thereto. Puffer teaches positioning a mirror in general proximity with the cable under inspection at a location that is longitudinally displaced from that portion of the cable surface that is irradiated. Puffer teaches that relatively abrupt discontinuities such as "pips" on the surface of the cable coating will serve to scatter the radiation in various directions, including longitudinally (axially) of the cable. Puffer teaches that a portion of the radiant energy scattered longitudinally of the cable will be incident on the mirror and is then deflected through suitable optics, such as an imaging lens for imaging onto a detector array. The detector array provides an electrical signal suitable for electronic analysis of the image so formed thereon. Further, Puffer teaches that utilization electronics may respond to the detector's electrical signal to generally indicate characteristics of the cable coating surface, including presence or absence of "pips" of at least a certain size.

Regarding claim 26, Applicants submit that the combination of McCoy and Puffer does not make claim 26 obvious to one skilled in the art. To establish a prima facie case of obviousness, one of the basic criteria that must be met is that the prior art references must teach or suggest all the claim limitations.[1] Neither McCoy nor Puffer teach or even suggest the requirement of claim 26 of an input device configured to receive *video* signals and generate *sequential images* from the *video* input. Also, neither McCoy nor Puffer teach or even suggest the requirement of claim 26 of a pattern classification software program configured to read the images generated by the input device and extract features from the images and compare the size of the features against user-defined thresholds. As discussed above, Puffer only receives light reflected off imperfections on the surface of the object. Puffer does not at any time create video signals. Nor does Puffer at any time create sequential images from the video signals. Puffer only teaches focusing the light reflections from the surface imperfections through an imaging lens for imaging onto a detector array. The detector array then provides an electrical signal based on the size of the light focused thereon suitable for electronic analysis. Applicants thus submit that claim 26 is not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

C. Rejection of Claims 27-30 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Puffer and Further in View of Kanzaka et al.

[1] MPEP § 706.02(j).

The Examiner rejected claims 27-30 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy et al. and Puffer as applied to claim 26 above, and further in combination with Kanzaka et al. (U.S. Patent No. 5,680,473).

The Examiner stated that the McCoy and Puffer combination does not receive location data indicating the position of a defect, generating the warning, and transmitting the image containing the defect and the location to the output device.

The Examiner stated that Kanzaka teaches a system for inspecting an elongated body in motion, comprising receiving location data indicating the position of a defect, and transmitting the image containing the defect and the location to an output device.

Regarding claims 28 and 29, the Examiner stated that the output device of Kanzaka includes a monitor and a printer. The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to record the defect location and image each time the defect alarm is generated in the McCoy and Puffer combination as taught by Kanzaka, in order to provide a permanent record of both the defect location and the defect image so that an operator can view and further classify the defects to ensure "an accurate judgment to the acceptance or rejection of the defect on the inspected object" as described by Kanzaka.

Regarding claim 30, the Examiner stated that the McCoy and Puffer combination does teach the classifier as recognizing unwanted defects and ignoring innocuous defects. The Examiner stated that Kanzaka teaches his classifier as recognizing unwanted defects and ignoring innocuous defects. The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to train the classifier of the McCoy and Puffer combination to distinguish between unwanted and innocuous defects as taught by Kanzaka, to further improve accuracy by flagging innocuous defects as such, and directing the operator's attention to more serious defects that could cause failure, and reduce the downtime association with an operator having to review surface conditions that are not serious, and will not cause failure.

Regarding claims 27-30, Applicants repeat the arguments made above for claim 26. As stated above, the combination of McCoy and Puffer do no render claim 26 obvious. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[2] As claims 27-30 depend from claim 26, Applicants thus submit that claims 27-30 are also not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

D. Rejection of Claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39, and 41 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al.

The Examiner rejected claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39, and 41 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria et al. (U.S. Patent No. 5,408,104 A).

[2] MPEP § 2143.03.

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The Examiner stated that, regarding each of these claims, McCoy teaches a system for surface inspection of a coiled tube as it is being deployed. The Examiner stated that, regarding claims 9 and 32 specifically, a warning event is initiated. The Examiner stated that, regarding claim 33, a guide is taught. The Examiner admitted that, while McCoy is open to "any suitable type of measurement apparatus known in the art for taking desired the measurements", McCoy does not teach an image processing measurement apparatus commensurate with the requirements of the claims.

The Examiner stated that, regarding each of the claims, Gorria teaches a system for inspecting an elongated tubular body in motion comprising plural imaging devices, capturing images of the tubular circumferences and passing the images to a processor where the images are processed by software, and identifying predetermined features of the tubing. The Examiner stated that, regarding claim 17, three CCD cameras are taught. The Examiner stated that, regarding claim 23, a recording is taught. The Examiner stated that, regarding claim 37, power is provided to the cameras and an illumination device. The Examiner stated that, regarding claims 5 and 39, the images are stored before processing. The Examiner stated that, regarding claim 41, size thresholds are taught.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the image inspection taught by Gorria, to inspect the moving coil tubing as required by McCoy, in order to inspect for and detect the dents, thinning and cracks as called for by McCoy to "provide for quantitative measurement of the magnitude thereof and to suppress or considerably attenuate the influence of the general appearance of the surface to be monitored", thereby not taking into account "certain defects of dimensions which are too small to have an influence on the characteristics of use of the products". The Examiner stated that the effect of the Gorria system is to reduce the indication of false defects and thus providing an accurate surface inspection system.

The teachings of McCoy are discussed above.

Gorria teaches a process and apparatus for the automatic monitoring of long products by artificial vision to detect different types of defects, to provide for quantitative measurement of the magnitude thereof, and to suppress or considerably attenuate the influence of the general appearance of the surface to be monitored. The process comprises using at least one linear CCD camera and a lighting means that lights the region of the product, towards which the camera is oriented. The inspected surface of the lit region is formed by a linear bar of N pixels that is oriented transversely with respect to the axis of movement of the product. Data acquisition and processing means measure, at equal successive time intervals, numerical values corresponding for each pixel to the amount of light received at the end of the time. The highest values are obtained for an excellent surface state of the product that reflects, like a mirror, the light coming from the lighting means. Stains or blemishes absorb a more or less substantial amount of light, while the various changes in level or scratches deflect or disperse the light. The processing means determines those defects by measuring the differences between the numerical values of each pixel that are successively measured after two exposure times such as t1, t2. It is then possible to determine the sum of those differences for all of the pixels, the variation in the value of that sum making it possible to detect the appearance or disappearance of defects. The lighting is provided

by a straight fluorescent tube which is oriented transversely. Gorria also teaches that a certain threshold measured value can be set for the time "t" to therefore filter out small variances and "noise" between measurements.

Regarding each of the claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39, and 41, Applicants submit that the combination of McCoy and Gorria does not make claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39, and 41 obvious to one skilled in the art. To establish a prima facie case of obviousness, there must be a reasonable expectation of success.[3] Also, the reasonable expectation of success must be found in the prior art and not based on the applicant's disclosure.[4] There is no reasonable expectation that McCoy would be successful when combined with Gorria. Gorria works on the premise that the object being examined is in a controlled environment where an amount of light focused on the inspection area can be maintained within certain controlled tolerances. However, the tolerances must be less than the minimum threshold measurement amounts used to filter out "noise". The minimum threshold amounts set minimum amounts of differences of light measured per pixel before using the value to detect a defect. Thus, Gorria would not be able to inspect coiled tubing at a well site where the amount of light shined on and thus reflected off of the coiled tubing varies throughout the procedure of injecting or removing the coiled tubing from the well. Gorria also assumes that the surface of the object being inspected is uniform in amount of light reflected if free of defects. With coiled tubing, however, the surface of the coiled tubing can vary even though no defects are present. Also, the presence of well fluid residues can affect the amount of light reflected from the coiled tubing. Given the method Gorria teaches and the amount of variances involved with coiled tubing, there is no reasonable expectation that McCoy would be successful when combined with Gorria. Applicants submit that with no reasonable expectation of success, claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39, and 41 are not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

E. Rejection of Claim 3 Under 35 U.S.C. § 103(a) as Being Unpatentable Over Newman and Kanzaka et al.

The Examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over the combination of Newman and Kanzaka. The Examiner stated that while Newman teaches determining "locations from which the amount of rotation can be calculated...electronically", Newman does not teach stamping the coordinates of the tube onto the image of the tube segment.

The Examiner stated that Kanzaka teaches a system for inspecting an elongated body in motion comprising receiving location data indicating a position of a defect, and stamping the coordinated of the tube onto the image of the tube segment.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to mix the location coordinates and images of Newman as taught by Kanzaka in order to have a log of the actual images along with locations for future review and analysis of tube rotations, and to be able to pinpoint exactly where on the tubing defects are located for longevity analysis and repair/correction of the tubing.

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[3] MPEP § 706.02(j).

[4] MPEP § 706.02(j).

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[5] As claim 3 depends from claim 1, Applicants submit that claim 3 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

F. Rejection of Claim 4 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria at al. and Further in View of Endsley et al.

The Examiner rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claim 1, and further in combination with Endsley (U.S. Patent No. 6,005,613 A).

The Examiner admits that while the McCoy and Gorria combination anticipates the use of color matrix CCD cameras, the combination does not teach 640x480 resolution with 8 bits per color.

The Examiner stated that Endsley teaches a CCD camera comprising 640x480 resolution with 8 bits per color.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the CCD camera taught by Endsley, as the CCD camera required by the McCoy and Gorria combination, in order to keep the system cost low by using a standard, commercially available and off-the-shelf camera, while providing a high quality 640x480 image to ensure an accurate inspection.

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[6] As claim 4 depends from claim 1, Applicants submit that claim 4 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

G. Rejection of Claims 8, 24, and 25 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al. and Further in View of Newman

The Examiner rejected claims 8, 24, and 25 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claim 6, and further in combination with Newman.

1. Claims 8 and 25

The Examiner admitted that the McCoy and Gorria combination does not suggest "diameter" as one of the predetermined features for measurement. The Examiner stated that Newman, in a system for determining defects and fatigue in a deploying coiled tubing, suggests the

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[5] MPEP § 2143.03.

[6] MPEP § 2143.03.

determination of "diameter". The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to include a determination of diameter as suggested by Newman, as part of the coiled tube evaluation of the McCoy and Gorria combination, because "change in diameter" is an indicator of "deformations that can cause problems when using the coiled tubing". The Examiner stated that this inclusion of a "diameter" measurement in the McCoy and Gorria combination further serves to ensure an accurate determination of the tubing's condition.

Applicants repeat the arguments made above for claims 1 and 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[7] As claim 8 depends from claim 1 and claim 25 depends from claim 15, Applicants submit that claims 8 and 25 are also not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

2. Claim 24

The Examiner admitted that the McCoy and Gorria combination does not teach one or more stripes on the outer layer parallel with the longitudinal axis of the tubing. The Examiner stated that Newman teaches a system in the same field of well digging, and same problem solving area of monitoring faults in tubing, where Newman teaches tubing with plural stripes individually distinguishable from one another. The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to mark the tubing of the McCoy and Gorria combination, with the lines taught by Newman, in order to provide an indication for the measurement of "amount of rotation" for "accurately determining coiled tubing fatigue life and/or deformation" to ensure proper functioning of the tube, and avoid the cost associated with a tube's failure during a mining operation.

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[8] As claim 24 depends from claim 15, Applicants submit that claim 24 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

H. Rejection of Claim 16 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al. and Further in View of Greenwood et al.

The Examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claim 15 and further in combination with Greenwood et al. (U.S. Patent No. 3,770,111 A). The Examiner admitted that while the McCoy and Gorria combination requires image capture devices around the periphery of the tubing, McCoy and Gorria do not teach the use of fiber optic image devices. The Examiner stated that Greenwood teaches an optical inspection system wherein Greenwood teaches the use of fiber optic imaging devices. The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the fiber optic image devices of Greenwood, in order to capture the images required by the McCoy and Gorria combination, in order to "gather light over a

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[7] MPEP § 2143.03.

[8] MPEP § 2143.03.

much larger portion" of the tubing with "a considerable decrease in optical complexity", thereby providing an accurate and detailed image using a less complex, less prone to failure, and lower cost image system.

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[9] As claim 16 depends from claim 15, Applicants submit that claim 16 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

I. Rejection of Claims 18, 21, 34, 35, and 40 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al. and Further in View of Kanzaka et al.

The Examiner rejected claims 18, 21, 34, 35, and 40 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claims 15 and 31 and further in combination with Kanzaka.

The Examiner stated that, regarding each of the claims, the McCoy and Gorria combination inspect and record defects along a length of tubing while in motion. Regarding claim 21 specifically, the Examiner stated that the McCoy and Gorria combination have a stacker. Regarding each of the claims, the Examiner stated that McCoy and Gorria do not teach a counter identifying a location along the tubing, where the computer reads the counter to identify the location at which a defect is found. Regarding claims 34, 35, and 40 specifically, the Examiner stated that McCoy and Gorria do not teach displaying the images of the features, indicating the position of a defect in the tubing. The Examiner stated that Kanzaka teaches a system for inspecting an elongated body in motion comprising receiving location data indicating a position of a defect. The Examiner stated that, specifically, Kanzaka teaches a counter identifying a location along the tubing where the computer reads the counter to identify the location at which a defect is found. The Examiner stated that Kanzaka stamps the coordinates of the tube onto the image of the tube segment. The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to provide and encoder and distance information taught by Kanzaka to the computer of the McCoy and Gorria combination in order to precisely note the location of the defect so that it can be further examined by an operator and/or repaired, and to provide data for the ultimate determination of the tube's life and possible failure modes.

Applicants repeat the arguments made above for claims 15 and 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[10] As claims 18 and 21 depend from claim 15 and claims 34, 35, and 40 depend from claim 31, Applicants submit that claims 18, 21, 34, 35, and 40 are also not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

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[9] MPEP § 2143.03.

[10] MPEP § 2143.03.

J. Rejection of Claims 18-21 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al. and Further in View of Chiu et al.

The Examiner rejected claims 18-21 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claim 15 and further in combination with Chiu et al. (U.S. Patent No. 6,031,931 A).

The Examiner stated that the McCoy and Gorria combination inspects and records defects along a length of tubing while in motion. Regarding claim 21 specifically, the Examiner stated that the McCoy and Gorria combination have a stacker. Regarding each of the claims, the Examiner admitted that McCoy and Gorria do not teach a counter identifying a location along the tubing, where the computer reads the counter to identify the location at which the defect is found. Regarding claims 19 and 20 specifically, the Examiner admitted McCoy and Gorria do not teach disabling or enabling the inspection system based on sensor speed.

The Examiner stated that Chiu teaches a system for inspecting an elongated body in motion comprising a counter receiving location data indicating a position of a defect and disabling or enabling the inspection system based on sensor speed.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to provide the encoder and distance information taught by Chiu, to the computer of the McCoy and Gorria combination, in order to detect the "beginning" of inspection when the tube starts to move, to "synchronize camera operation with" the tube's movement, and to precisely note the location of the defect so that it can be further examined by an operator and/or repaired, and to provide data for the ultimate determination of the tube's life and possible failure modes.

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[11] As claims 18-21 depend from claim 15, Applicants submit that claims 18-21 are also not obvious under 35 U.S.C. § 103(a) and are in condition for allowance.

K. Rejection of Claim 42 Under 35 U.S.C. § 103(a) as Being Unpatentable Over McCoy et al. and Gorria et al. and Further in View of Husseiny

The Examiner rejected claim 42 under 35 U.S.C. § 103(a) as being unpatentable over the combination of McCoy and Gorria as applied to claim 31 and further in combination with Husseiny (U.S. Patent No. 5,210, 704 A).

The Examiner admitted that the McCoy and Gorria combination does not teach identifying a feature as a defect by determining if a defect size has grown beyond a percentage of its original size. The Examiner stated that Husseiny teaches a system in the field of defect inspection and failure analysis, comprising identifying a feature as a defect by determining if a defect size has grown beyond a percentage of its original size.

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[11] MPEP § 2143.03.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to monitor defect growth on the coiled tubing of the McCoy and Gorria combination, and thereby identify defects when a threshold has been reached as taught by Husseiny, in order to identify "incipient failures...during operation" and provide an indication to the operation of the tube's "expected life" along with "a warning for the remaining time until failure of the equipment", thereby providing the operator with the ability to predict a failure before it actually occurs in order to take appropriate action and avoid costly losses during an operation.

Applicants repeat the arguments made above for claim 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[12] As claim 42 depends from claim 31, Applicants submit that claim 42 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

L. Rejection of Claim 42 Under 35 U.S.C. § 103(a) as Being Unpatentable Over Newman and Husseiny

The Examiner rejected claim 42 Under 35 U.S.C. § 103(a) as being unpatentable over the combination of Newman and Husseiny.

The Examiner admitted that Newman does not teach identifying a feature as a defect by determining if a defect size has grown beyond a percentage of its original size. The Examiner states that Husseiny teaches a system in the field of defect inspection and failure analysis comprising identifying a feature as a defect by determining if a defect size has grown beyond a percentage of its original size.

The Examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to monitor defect growth on the coiled tubing of Newman, and thereby identify defects when a threshold has been reached as taught by Husseiny, in order to identify "incipient failures...during operation" and provide an indication to the operation of the tube's "expected life" along with "a warning for the remaining time until failure of the equipment", thereby providing the operator with the ability to predict a failure before it actually occurs in order to take appropriate action and avoid costly losses during an operation.

Applicants repeat the arguments made above for claim 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.[13] As claim 42 depends from claim 31, Applicants submit that claim 42 is also not obvious under 35 U.S.C. § 103(a) and is in condition for allowance.

IV. AMENDMENTS MADE NOT RELATED TO PATENTABILITY

[12] MPEP § 2143.03.

[13] MPEP § 2143.03.

Applicants have amended claims 1, 9, 13, 15, and 20 to more clearly, correctly, and properly claim the invention and not for purposes of patentability.

These statements are not meant to be an admission that the other amendments were necessarily made for purposes of patentability, to be limiting in any way, or to be all-inclusive of amendments not made for purposes of patentability.

CONCLUSION

Applicants respectfully request reconsideration and allowance of the pending claims. If the Examiner feels that a telephone conference would expedite the resolution of this case, he is respectfully requested to contact the undersigned.

In the course of the foregoing discussions, Applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. There may also be other distinctions between the claims and the prior art that have yet to be raised, but that may be raised in the future.

Respectfully submitted,

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MARKED-UP VERSIONS OF AMENDED CLAIMS

1. (Amended) An inspection system for coiled tubing being employed in a well, the system comprising:

an imaging device recording video signals of a segment of the coiled tubing as the coiled tubing is being <u>injected into or removed from</u> [employed into] the well;

a conductor transmitting the video signals to a processor;

an image grabber generating an image of the tubing segment from the video signals; and

a program in the processor analyzing the image to detect predetermined features of the tubing segment.

9. (Amended) The system of claim 1 wherein the processor generates a signal upon detecting a <u>predetermined feature</u> [defect] in the tubing so as to provide a warning of such <u>predetermined feature</u> [defect].

13. (Amended) An inspection system comprising:

a composite coiled tubing having layers of fibers forming a tubing wall<u>, the outermost layer having a longitudinal stripe</u>;

[an outermost layer having a longitudinal stripe;]

an imaging device recording video signals of a segment of the coiled tubing as the coiled tubing is presented before the imaging device;

a processor receiving the video signals from the imaging device; and

a program in the processor analyzing the video signals to detect the stripe on the tubing segment.

15. (Amended) An automated inspection system for identifying defects in coiled tubing, comprising:

[a computer system configured to execute pattern recognition software; and]

a plurality of imaging devices configured to capture video images of coiled tubing as the tubing passes in front of the imaging devices; <u>and</u>

<u>a computer system configured to execute pattern recognition software to analyze the images, extract features from the images, and generate an indication if a defect is identified in the images.</u> [an image being transmitted to the computer system and the pattern recognition software analyzing the image, extracting features from the image, and generating a indication if a defect is identified in the image.]

20. (Amended) The inspection system of claim 18 wherein if the counter signal indicates that the coiled tubing is moving faster than <u>a</u> [the] threshold, the inspection system is enabled.

<u>26.</u> [27.] (Amended) A computer system for use in an automated tubing inspection system comprising:

a processor;

at least one output device;

an input device configured to receive video signals and generate sequential images from the video input;

a pattern classification software program configured to read the images and extract features from the images and compare the size of these features against user-defined thresholds;

wherein if the pattern classification software determines that the size of the features does not fall within the user-defined threshold, the software generates an interrupt indicating that a defect has been located.

27. [28.] (Amended) The computer system of claim 26 [27] further comprising:

an input for receiving location data indicating the position from which the incoming images are taken;

wherein when the pattern classification software generates the warning interrupt, the computer system transmits the image containing the defect and the corresponding location data to the output device.

28. [29.] (Amended) The computer system of claim 27 [28] wherein the output device is a printer.

29. [30.] (Amended) The computer system of claim 27 [28] wherein the output device is a monitor.

30. [31.] (Amended) The computer system of claim 27 [28] wherein the pattern classification software may be trained to recognized unwanted defects and ignore innocuous features.

31. [32.] (Amended) A method of identifying defects in a continuous length of coiled tubing, comprising:

passing the continuous length of coiled tubing in front of a plurality of imaging devices;

capturing images of the outer circumference of the tubing with the imaging devices and transmitting the images to a processor;

receiving the images by the processor and inputting the images to computer vision software running on the processor; and

processing the images on the computer vision software; and

identifying predetermined features in the tubing.

32. [33.] (Amended) The method of claim 31 [32] further including initiating a warning event upon detecting a defect in the tubing.

33. [34.] (Amended) The method of claim 31 [32] wherein the passing step includes guiding the coiled tubing through a guide roller mechanism as the tubing is spooled on or off a storage reel and placing the aperture of a plurality of imaging devices in close proximity to the guide roller mechanism.

34. [35.] (Amended) The method of claim 31 [32], further comprising:

transmitting a depth counter value the processor to identify the position along the tubing at which the images are taken; and

displaying the image of the features.

<u>35.</u> [36.] (Amended) The method of claim <u>34</u> [35] further including indicating the position of a defect in the tubing.

<u>36.</u> [37.] (Amended) The method of claim <u>31</u> [32], further comprising:

specifying the annular location of a predetermined feature with respect to an annular reference established by at least one longitudinal stripe located on the outer diameter of the tubing; and

indicating the annular position of the predetermined features.

<u>37.</u> [38.] (Amended) The method of claim <u>31</u> [32], further comprising transmitting power to operate the imaging devices and transmitting light to illuminate the tubing.

<u>38.</u> [39.] (Amended) The method of claim <u>31</u> [32], wherein the imaging devices are located on a levelwind that is coupled to a reel on which the tubing is coiled.

<u>39.</u> [40.] (Amended) The method of claim <u>31</u> [32], further comprising storing the images on recordable media prior to processing the images.

<u>40.</u> [41.] (Amended) The method of claim <u>39</u> [40], further comprising storing the images with the depth counter value.

41. [42.] (Amended) The method of claim 31 [32], further comprising identifying a feature as a defect by determining if the size of an unrecognized feature exceeds a user-designated threshold.

42. [43.] (Amended) The method of claim 31 [32], further comprising identifying a feature as a defect by determining if the size of a previously recognized defect has grown beyond a user-designated percentage of its original size.

43. (New) The system of claim 1 wherein the coiled tubing comprises an outer wear layer and a contrasting layer beneath the outer wear layer where if the outer wear layer is worn away, the contrasting layer becomes visible as a contrasting feature on the tubing.

44. (New) The system of claim 43 wherein the coiled tubing further comprises a stripe located on the outer wear layer and parallel to the longitudinal axis of the tubing.

45. (New) The system of claim 44 wherein the coiled tubing comprises more than one stripe located on the outer wear layer and wherein the stripes are individually distinguishable.